

author finds that starch is developed even in this plant in the young leaves.

The starch of the stomatal guard cells is next examined, and the difficulty of depleting these cells discussed. In experiments with cut leaves exposed to sunlight little or no appreciable increase of starch could be obtained. In experiments with pieces of leaves floated on sugar solutions, cane sugar was found to produce starch far better than any other; invert-sugar, glucose, and fructose follow next in order, and maltose is almost useless.

The necessary details of the experiments, and discussion of results and previous literature are given in the full paper.

In Part II the author deals in detail with certain inulins which he has discovered in *Scilla nutans* and *Galanthus nivalis*, and shows by the examination of many other genera that inulin is by no means uncommon in Monocotyledons.

The inulin of *Scilla* is remarkable for its easy solubility in cold water, while that of *Galanthus* requires water at 80° C. for solution; ordinary inulin from *Helianthus* and other Compositæ dissolves at about 50° C.

The proofs of the inulin nature of these bodies, their reactions and mode of occurrence are worked out in detail. Contrary to previous assumption, inulin and starch may co-exist in the same cell.

It is interesting to note that aquatic species do not store inulin, apparently, but that it is common in those inhabiting dry situations; the author regards the concentrated solution in the cell-sap of such plants as useful in resisting drought.

The paper concludes with a detailed examination of the behaviour of the starch and inulin in the bulb of *Galanthus* at various periods throughout its whole annual cycle of development, comparing the stages with those in the bulb of *Narcissus*.

Summaries of the literature, and illustrations, accompany the full paper.

“Further Observations on the Effects of Partial Thyroidectomy.”

By WALTER EDMUNDS. Communicated by Dr. ROSE BRADFORD, F.R.S. Received October 17,—Read November 17, 1898.

(From the Laboratory of the Brown Institution.)

Two years ago Vassale and Generali published some interesting experiments on the thyroid; they found that excision of the four parathyroids that occur in dogs (leaving the thyroid lobes) was followed by symptoms practically identical with those produced by excision of the entire thyroid, including the parathyroids.

These observations I have repeated: eighteen experiments were made in dogs; in all it was intended to excise all the parathyroids, leaving, as a rule, the thyroid proper; but in seven it was subsequently found that one, and in one case two, of the smaller parathyroids had escaped excision; these seven experiments were therefore cases of partial parathyroidectomy or parectomy.

Of the eleven experiments in which the whole of the parathyroids is believed to have been removed, in two, one of the thyroid lobes was removed at the same time; of these two, one dog died the night after operation and the other survived the operation, but died when the remaining thyroid lobe was subsequently removed.

Of the nine cases in which the parathyroids only were removed, four died: one in two days, one in four days, one in seven days, and one in twenty-eight days.

The other five survived the operation, two after temporary symptoms and three without.

Thus of the nine total parectomies, four died, two recovered after symptoms, and three without.

The five which recovered were submitted to further excision of one thyroid lobe, and (if they survived this) of the other thyroid lobe. Two died after removal of the first lobe, one died after removal of the second lobe, and two survived even this, which amounted to total thyroidectomy, but they both had temporary symptoms.

The symptoms produced by these operations were (1) tremors, (2) a slow and most unstable gait, sometimes going on to paralysis of the hind limbs, and (3) emaciation and weakness.

In two of the dogs an interesting eye symptom was noticed, viz., a narrowing of the palpebral fissures with apparent recession of the eyeballs. This occurred in one dog who succumbed to excision of the parathyroids only, and in one dog who survived this, but died after excision of one thyroid lobe.

In six of the eleven cases microscopic changes were found in the thyroid lobes left at the excision of the parathyroids; these changes were (1) a diminution or absence of the colloid in the vesicles, (2) an excessive amount of intervesicular young thyroid tissue, (3) multiplication of secreting cells in the thyroid vesicles, and (4) the secreting cells becoming columnar. These changes are very similar to or identical with those described as compensating hypertrophy of the thyroid, and to those found in Graves's disease.

In seven dogs the larger parathyroids were removed, but it was subsequently found that one, and in one case two, of the smaller parathyroids had escaped excision, these were therefore cases of partial parectomy.

Notwithstanding the incompleteness of the excision, in one of these cases the animal succumbed to the operation after seventy-two days.

The other six dogs did not die, but four of them had temporary symptoms; they were submitted to further thyroid excisions, from which they all died, one after simultaneous excision of both thyroid lobes, three after removal of one thyroid lobe only; two survived this operation, one of them having temporary symptoms; these both died after removal of the remaining lobe.

In this series, too, besides the usual symptoms of tremors, unstable gait and paralysis, emaciation and weakness, eye symptoms were observed,—in four out of the seven dogs.

In two, after the partial parectomy, the eyes became unduly prominent, but subsequently, after a further operation on the thyroid, the palpebral fissures became narrow, and the eyeballs retracted.

In one of the partial parectomies no change was noticed, but after one of the thyroid lobes had been excised the eyes became unduly prominent, and after the remaining lobe had been excised the palpebral fissures became narrowed, the eyeballs retracted, and the animal died.

In one, after removal of some of the parathyroids, and also, after an interval, of one of the thyroid lobes, no change was noticed; but after the removal of the remaining lobe with a parathyroid attached, the palpebral fissures became narrowed, and the eyes retracted.

Altogther in the eighteen dogs operated on, ocular changes were noticed in six.

In the partial parectomies, changes in the thyroid lobes left were also observed, the same as those found in complete parectomies and in Graves's disease.

Similar effects on the eyes were also noticed in monkeys, but these, eight of them, were subjected to total excision of the thyroid including the parathyroids; four of the monkeys died as a consequence of the operation: one in thirteen days, one in thirty-six days, one in sixty-eight days, and one in 262 days; three of them were treated with thyroid extract, but this, although it produced marked benefit, did not save their lives. One monkey was killed by accident; the other three are still alive.

As to their eye symptoms: in two the eyes appeared to be more prominent, and the palpebral fissures were wider; and in two the palpebral fissures were narrowed, and the eyes appeared sunken. In four no change could be seen. Drawings of the monkeys were made, before and after operation.